



The Effect of Co-Axial Incisions on the Traction Removal Force of Mushroom-Retained Gastrostomy Tubes

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Introduction: Removal of mushroom-retained tubes is associated with trauma along the stoma tract producing pain, bleeding, and site infection. We aim to provide proof-of-concept data for an alternative removal technique by evaluating the effect of co-axial incisions of the mushroom-retention gastrostomy tube on the required force for removal.

Methods: An ex-vivo model of the and gastrostomy stoma was fabricated with a polyethylene through which a mushroom-retained gastrostomy tubes may be introduced. Three tube sample groups were created representing unmodified 20 Fr tubes, and 20 Fr tubes with one, or two co-axial cuts extending though the mushroom retention feature. The maximum force required for tube removal via traction was measured with a digital force sensor. The required forces for each sample group were compared using a two sample t-test.

Results: A total of 70 traction removal procedures of mushroom-retained gastrostomy tubes were conducted. In comparison to an unmodified tube, reduction in the mean force required for removal was statistically significant in both the single axial cut group ($p < 0.05$) and the two co-axial cut group ($p < 0.05$). The addition of co-axial incisions facilitated the folding of the mushroom-retention mechanism and reduced the amount of deformation required to fold through the tract.

Discussion: Axial incisions of a mushroom-retained gastrostomy tube result in statistically significant reduction in the traction force required for removal in our benchtop model. The current study supports the development of an instrument that may safely and efficaciously create co-axial incisions in an in-situ mushroom-retained gastrostomy tube.

Conclusion: An instrument that creates axial incisions of a mushroom-retained gastrostomy tube would result in a decrease in the required force for removal and theoretically decreased trauma to the stoma tract.

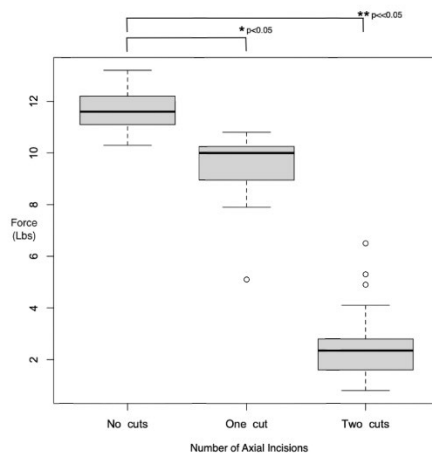


Figure 1a. Box plot representation of the force of gastrostomy tube removal in the three tube groups. Reduction in the mean force required for removal was statistically significant in both axial cut groups.



Figure 1b. Images depicting gastrostomy tube mushroom retention discs with no incisions, one axial incision, and two axial incisions.